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Short report

The detection of female DNA from the penis in sexual assault cases

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Abstract

An investigation was performed with the aim of assessing the success rate of the examination of penile swabs or imprints for the detection of the female DNA profile. Two hundred twenty seven cases from a 3-year period were retrospectively reviewed. In 57% of the cases, no suitable material was available. Of the remaining 97 cases, 26 provided a DNA profile from the female victim. It is concluded that although the total success rate is low, it is worthwhile performing the examination, especially if there is a short interval between the alleged sexual assault and the examination.

Keywords: Penis; Vaginal cells; DNA; Sexual assault

1. Introduction

In a medico-legal examination in sexual assault cases, it is important to collect evidence for the substantiation of an allegation of sexual intercourse. DNA can be extracted from female cells shed during sexual intercourse and may be used to identify the female sexual participant.[1–3] The success of the collection of evidence is dependent on a variety of conditions. It was the object of the present study to report the rate of success in the documentation of a female DNA profile in cells obtained from penile swabs or imprints of an alleged perpetrator in sexual assault cases.

2. Materials and methods

A 3-year retrospective investigation (October 1st, 1999 to September 30th, 2002) was performed of all sexual assault cases where the alleged perpetrator had a clinical forensic examination in Denmark, Greenland or the Faroe Islands. Penile swabs or imprints (a glass slide pressed against the penis) had been collected and examined in 227 cases. Forty seven cases originated in the Institute of Forensic Medicine, University of Aarhus, 40 cases from the Institute of Forensic Medicine, University of Southern Denmark, Odense, 103 cases from the Institute of Forensic Medicine, University of Copenhagen, 36 cases from Greenland and 1 case from the Faroe Islands.

The staining of the air-dried smears or imprints was carried out using diluted Lugol's solution.[4,5] DNA-analysis was carried out using Chelex-based DNA extraction,[6] slot–blot and hybridization for quantification,[7] and the AMP*Fl*STR SGM Plus multiplex kit for PCR amplification.[8] Only samples displaying a DNA-concentration exceeding 0.02 ng/μL were attempted amplified. PCR products were analysed using an automated sequencer (ABI 377 or ABI 3100) and GeneScan and GenoTyper software.

3. Results

The mean age of the alleged perpetrators was 31 years (range 9–72 years) while the victims' mean age was 27 years

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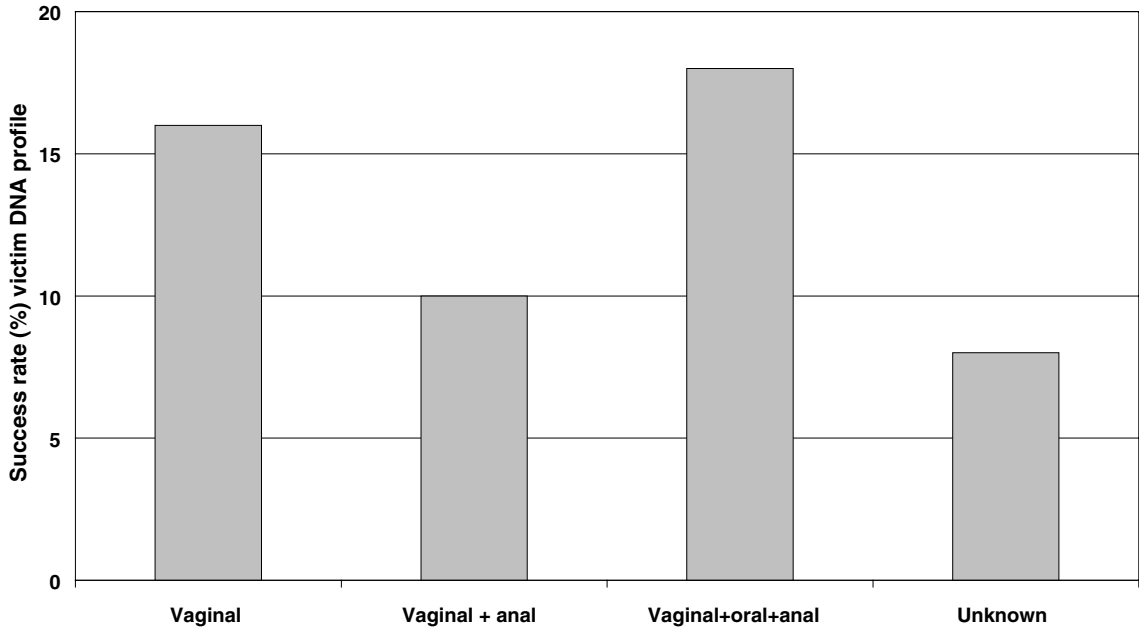

Fig. 1. Type of sexual assault compared to the rate of successful victim DNA profiling.

(range 2–81 years). The mean time interval from assault to examination was 18 h (range 1–154 h).

In 97 of the cases, it was deemed fruitful to examine cells from the penile surface. The remaining 130 cases held no suitable material for DNA extraction.

The different types of sexual assault in which the DNA profile of the female victim was successfully obtained are shown in Fig. 1. Female cells were more likely to be detected from the penis where penetration of three body orifices, i.e., mouth, anus and vagina, was alleged to have occurred.

In 47 of the examined cases, Lugol positive cells were found. It was found that it was much more frequent to establish a victim DNA profile in the Lugol positive cells (49%) than in the Lugol negative cells (6%). Not unexpectedly, the mean time interval from assault to examination was shorter in the cases with successful DNA profiling (mean 7 h, range 1–15 h) than in the remaining cases (mean 19 h, range 2–154 h). This difference was highly significant (t-test $p < 0.003$).

4. Discussion

The investigation has shown that within a certain time interval since sexual assault, an attempt should be made to identify female cells on the perpetrator's penis. The positive finding of the alleged victim's cells on the suspect's penis is a strong indication of sexual activity between the two. If these cells are Lugol positive, it is further evidence that there has been vaginal intercourse. Lugol's solution is composed of iodine and potassium iodide in water. It stains the glycogen in mature squamous epithelium a dark brown colour. The high number of Lugol negative cells may be due to these cells partly originating from the male himself or from the victim's oral cavity or anus. Furthermore, as the Lugol reaction is dependent upon the oestrogen status, positive cells cannot be expected in postmenopausal women and in some phases of the menstrual cycle in younger women. The presence of Lugol positive cells containing glycogen is not definitive proof that the cells are vaginal as male urethral cells may also be Lugol positive. It is of course mandatory to establish the DNA type of the suspected perpetrator.

It might be argued that positive finding of a DNA profile from the alleged victim in only 26 cases of the 97 examined is not a high success rate. It is consistent with previous studies,[1,2] and it is obvious that the success rate primarily depends on the time interval from sexual assault until the forensic examination.

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